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July 17, 2003

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Subject Entergy Nuclear Operations, Inc.
 Pilgrim Nuclear Power Station
 Docket No. 50-293 License No. DPR-35

 Licensee Event Report 2003-002-00

Letter Number: 2.03.088

Dear Sir:

The enclosed Licensee Event Report (LER) 2003-002-00, "Unplanned Automatic Closing of the Main Steam Isolation Valves and Resultant Scram due to Licensed Operator Error During Startup," is submitted in accordance with 10 CFR 50.73

This letter contains no commitments.

Please feel free to contact me if there are any questions regarding this subject.

Sincerely,


Michael A. Balduzzi

DWE/dd

cc: Mr. Hubert J. Miller
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Senior NRC Resident Inspector

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INPO Records

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BACKGROUND

The Pilgrim Station turbine-generator receives steam from the reactor vessel and converts a portion of the steam to electrical energy. The turbine-generator and related control system is nonsafety-related. The turbine-generator is equipped with a mechanical-hydraulic control system.

The turbine steam bypass system is designed to control reactor pressure during reactor startup, while the turbine is brought up to speed and the generator is synchronized with the offsite transmission system, during power operation when reactor steam generation exceeds transient turbine steam requirements and limitations, and during a reactor cooldown. The bypass system includes three hydraulic, sequentially operated bypass valves having a total bypass capacity of 25% of turbine design steam flow. The bypass system includes a pressure regulator consisting of a mechanical pressure regulator (MPR) and an electric pressure regulator (EPR). Either pressure regulator functions to control pressure. A malfunction of the pressure regulator is an operational event that is analyzed in the Pilgrim Station Updated Final Safety Analysis Report.

The Primary Containment Isolation Control System (PCIS) is arranged into groups. The Group I logic circuitry is designed to automatically initiate the closing of isolation valves that include the main steam isolation valves (MSIVs) and main steam drain line isolation valves. When the reactor mode switch is not in the RUN position, the PCIS Group I isolation signal for the main steam low pressure trip function is bypassed unless a high reactor water level condition occurs. The closing of the MSIVs due to a high reactor water level condition is nonsafety-related and functions to protect the turbine from damage due to water.

The reactor protection system (RPS) is designed to automatically initiate a scram signal for the insertion of the control rods if certain conditions occur. The conditions include the closing of at least one MSIV (greater than 10% closed) in three or more steam lines.

The following conditions existed just prior to the event. The Core Standby Cooling Systems, Reactor Core Isolation Cooling System, Emergency Diesel Generators, Shutdown Transformer, and the Station Blackout Diesel Generator were operable, in standby service. The offsite 345 kV transmission system was energized. The 345 kV switchyard air circuit breakers were closed. The Pilgrim Station 4.16 kV distribution system was powered from the transmission system via the Startup Transformer. The main condenser was being cooled by the circulating water system. The condensate and feedwater systems were in service. The reactor mode selector switch was in the STARTUP position. The reactor was operating at about 2.5% power with the Intermediate range neutron monitors operable. The reactor water level was normal, at about +29" (narrow range level).

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The reactor / main steam pressure was about 880 psig. The MPR was controlling reactor pressure with the MPR setpoint slightly above 900 psig. The EPR was in standby service with the setpoint at 940 psig.

On May 19, 2003 at 0424 hours, the control room annunciator, "Bypass Valve Not Closed," was received and the number 1 bypass valve was observed opening.

In response to the alarm, the licensed operator responsible for balance of plant (BOP) operation reported the following observations and actions taken by him. The operator increased the MPR setpoint for approximately one to two seconds, in order to increase the steam pressure setting and thereby, cause the bypass valve to close. During this period the operator observed the MPR Indicating lights flickering. The operator also observed the bypass valve cam position indicating >80% and the associated control switch red (open) indicating light illuminated. The control position for the turbine bypass valve opening jack (BVOJ) was observed at zero percent. Meanwhile, other control room licensed operators reported the number 1 and number 2 bypass valves were open and the number 3 bypass valve was partially open. Investigation after the event determined the licensed operator responsible for BOP operation had operated the BVOJ control switch in the open direction instead of operating the MPR setpoint control switch in the raise direction to increase the steam pressure setting and thereby, close the bypass valve in response to the alarm. The operation of the BVOJ control switch in the open direction resulted in the opening of the bypass valves.

The opening of the bypass valves introduced a transient condition -- a decrease in the main steam / reactor vessel pressure. The pressure ultimately decreased to about 805 psig. The decrease in pressure caused an increase in the void fraction in the reactor water and consequent increase in the water level, to about +55" (narrow range).

EVENT DESCRIPTION

On May 19, 2003 at 0425 hours, an unplanned actuation of the Group I portion of the PCIS circuitry occurred in accordance with design due to concurrent high reactor vessel water level and low main steam line pressure conditions. The actuation resulted in the closing of the Group I isolation valves including the MSIVs and main steam drain line isolation valves (MO-220-1 and MO-220-2) that were open at the time of the event.

In accordance with design, the closing of the MSIVs (to greater than 10% closed while the reactor steam pressure was greater than about 600 psig) resulted in an automatic actuation of the reactor protection system (RPS). The resultant scram signal resulted in the automatic insertion of the control rods that were withdrawn at the time of the event.

The closing of the MSIVs also resulted in an increase in the reactor vessel pressure. The increased reactor pressure and scram resulted in an expected decrease in the reactor vessel water level to about +2" (narrow range level). The decrease, to less than the low water level trip setting of less than +12", resulted in the automatic actuation of the Group 2 and Group 6 portions of the PCIS and actuation of the reactor building isolation control system (RBIS).

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The actuation of this portion of the PCIS included the following designed responses:

- Automatic closing of the Group 2 Isolation valves (Sampling System) that were open.
- Automatic closing of the Group 6 (Reactor Water Cleanup System) isolation valves that were open.

The RBIS actuation resulted in the automatic closing of the Reactor Building ventilation system supply and exhaust dampers and automatic start of the Standby Gas Treatment System trains 'A' and 'B'.

Licensed operator response included the following. The position of the reactor mode switch was moved to the SHUTDOWN position. Initially, there was no full-in position indication for five control rods on the Rod Position Indication System even though the plant process computer call rods function indicated all of the control rods were fully inserted. These five control rods had inserted beyond a full-in position indication and consequently, a position indication for these control rods was not immediately observed.

While actions were being taken to ensure all of the control rods were fully inserted, the control rod drive system charging water valve was closed in accordance with procedure. This action resulted in all control rods settling and indicating a full-in position.

The reactor water level was subsequently restored within a band of 20" to 40".

Later, with the MSIVs still closed, the BVOJ control switch was moved to the close position and this resulted in the closing of the bypass valves. After the PCIS Group I Isolation signal was reset, the main steam drain line isolation valves were reopened with the downstream drain line valve in a throttled position. This configuration established reactor pressure control and a steam pathway to the main condenser. The MSIVs were left in the closed position for operational considerations, to maintain a hot standby condition, while the reactor pressure was greater than 576 psig.

The event was documented in a corrective action program condition report. The NRC Operations Center was notified of the unplanned actuations of the RPS, PCIS, and RBIS in accordance with 10 CFR 50.72 at 0539 hours on May 19, 2003.

The post-trip review was completed by 1719 hours on May 19, 2003. The MSIVs were opened at 1752 hours, with the reactor pressure at about 300 psig.

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CAUSE

The direct cause of the PCIS Group I Isolation that resulted in the automatic closing of the MSIVs, resultant RPS actuation and consequent actuation of the PCIS and RBIS was concurrent high reactor water level and low main steam pressure (< 810 psig) while the reactor mode selector switch was in the STARTUP position (not in the RUN position). The high water level and low steam pressure were the result of transient conditions that occurred as a result of the opening of the turbine steam bypass valves. The bypass valves opened as designed because of the manual operation of the BVOJ control switch.

The root cause of the event was licensed operator error. The operator responsible for BOP operation operated the BVOJ control switch in the OPEN direction instead of operating the MPR control switch in the RAISE direction to increase the steam pressure setting and thereby, close the bypass valve(s) in response to the control room alarm that occurred just prior to the event. There were no contributing causes.

The Human Performance error for this event involved the operation of a control switch other than that intended. A review of the corrective action program database determined this error appears to be an isolated event involving a specific individual. An adverse trend regarding this specific type of Human Performance error does not exist. Several recent corrective action program condition reports, however, have identified an adverse trend regarding the adequate use of Human Performance tools and thus, the development and implementation of a Human Performance improvement action plan was considered prudent to enhance operator performance in this area.

CORRECTIVE ACTION

Corrective actions taken included the following:

- A fact finding of the event was conducted in accordance with procedure.
- A team was assembled to investigate an apparent malfunction of the turbine pressure control system. The team concluded the control system did not malfunction.
- On May 20, 2003 the Operations Manager conducted a Human Performance stand-down with all Operations personnel. The stand-down was held to review the lessons learned from the event.
- An INPO Assist visit was conducted. The focus of this action was Operations Human Performance and adherence to standards and expectations.

Required corrective actions planned includes the following:

- Incorporate the lessons learned from the root cause analysis in the Licensed Operator Requalification Training program.

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- Evaluate methods to establish appropriate Human Performance factors defenses associated with the control switches of the BVOJ, MPR, and EPR. Possible enhancements include the use of cover boxes, a removable switch and/or a different style of control switch handle.

Corrective actions planned to preclude recurrence includes the following:

- Coach the responsible licensed operator on Operations Management expectations regarding the proper use of Human Performance tools during the performance of the operator's duties.
- Develop and implement an Operations Human Performance improvement action plan.

These actions are tracked in accordance with the corrective action program and may be modified in accordance with the corrective action program.

SAFETY CONSEQUENCES

The event posed no threat to public health and safety.

The actuation of the PCIS Group I circuitry was the designed response of the mode switch being in the STARTUP position (not RUN position) in conjunction with the concurrent conditions of main steam pressure being less than 810 psig and the reactor water level being greater than at about +55".

The closing of the Group I valves due to a high reactor vessel water level while the reactor mode switch is not in the RUN position is a function that protects the turbine from damage due to water. The high water level that occurred, about +55", was about 57" below the level corresponding to the bottom of the main steam lines.

The closing of the Group I valves due to a reactor / main steam low pressure condition (\leq 810 psig) when the reactor mode switch is not in the RUN position functions to protect the reactor against a reactor depressurization and resultant cooldown of the vessel if a malfunction of the pressure regulator occurs. The inventory loss from the reactor vessel resulting from such a malfunction is limited by the closure of the MSIVs. For this event, a pressure regulator malfunction did not occur.

If, however, the event had occurred when the reactor power was slightly higher (i.e. about 6%) when the reactor mode switch was in the RUN position, the high water level trip function is inhibited but the low steam line pressure trip function is not. When the reactor mode switch is in the RUN position, a reactor / main steam low steam pressure condition (\leq 810 psig) would actuate the Group I circuitry to ensure the MSIVs close before the reactor pressure decreases to $<$ 785 psig. This isolation function is primarily intended to prevent excessive depressurization in the event of a malfunction of the pressure regulator. This function also provides automatic protection for the low reactor pressure - core thermal power safety limit relationship (i.e. $<$ 785 psig reactor power and \leq 25% of rated core thermal power).

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The actuation of the RPS was the designed consequence of the closing of at least one MSIV (10% closure) in three or more main steam lines while the reactor pressure was less than 810 psig. All eight MSIVs (two in each of the four steam lines) closed in response to the Group I Isolation signal. The MSIV scram function (greater than 10% closed) anticipates the pressure and neutron flux transients that occur during normal or inadvertent closing of the MSIVs. With the scram setting at 10% of MSIV closure, the neutron flux does not increase.

After the MSIVs closed, the MSIVs were left in the closed position for operational considerations, to maintain a hot standby condition, while the reactor pressure was greater than 576 psig. The MSIVs were opened later, when the reactor pressure was about 300 psig.

The MSIVs, however, could have been opened earlier if necessary. After the PCIS Group I Isolation signal resulted in the closing of the MSIVs and main steam drain line isolation valves, the main steam lines drain line isolation valves were opened to establish a steam pathway from the reactor vessel to the main condenser. The opening of drain line isolation valves was achieved after the manual reset of the PCIS Group I Isolation logic circuitry. After the reset, the ability to open the MSIVs was not impacted. The control switches for the MSIVs are located in the main control room and are readily available to the operators and hence, the opening of the MSIVs, if necessary for decay heat removal from the reactor vessel, was assured.

The actuation of the PCIS (Groups 2 and 6) and RBIS was the expected consequence of the low reactor water level that occurred as a result of the scram. The low water level that occurred, about +2" (narrow range), was about 48" above the trip setting for an automatic actuation of the Core Standby Cooling Systems and about 129" above the level corresponding to the top of the active fuel zone.

During the event, the Core Standby Cooling Systems and the Reactor Core Isolation Cooling System were operable to provide makeup water and core cooling if necessary.

REPORTABILITY

This report was submitted in accordance with 10 CFR 50.73(a)(2)(iv) because the actuations of the RPS, PCIS, and RBIS were not planned.

SIMILARITY TO PREVIOUS EVENTS

A review for similarity was conducted of Pilgrim Station Licensee Event Reports (LERs) submitted since 2000. The review focused on LERs that involved a similar event or was caused by a licensed operator error. The review identified no similar events but identified LER 2002-002-00 that reported both trains of the control room high efficiency air filtration system being inoperable for about four hours due to licensed operator error.

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ENERGY INDUSTRY IDENTIFICATION SYSTEM (EIIS) CODES

The EIIS codes for this report are as follows:

COMPONENTS**CODES**

Indicator, special (ZI-2022)	XI
Panel	PL
Switch, hand (control switch)	HS
Valve, control, pressure (bypass valve)	PCV
Valve, isolation (MSIVs, drain valves)	ISV

SYSTEMS

Engineered Safety Features Actuation System (PCIS, RPS, RBIS)	JE
Turbine Steam Bypass Control System	J1